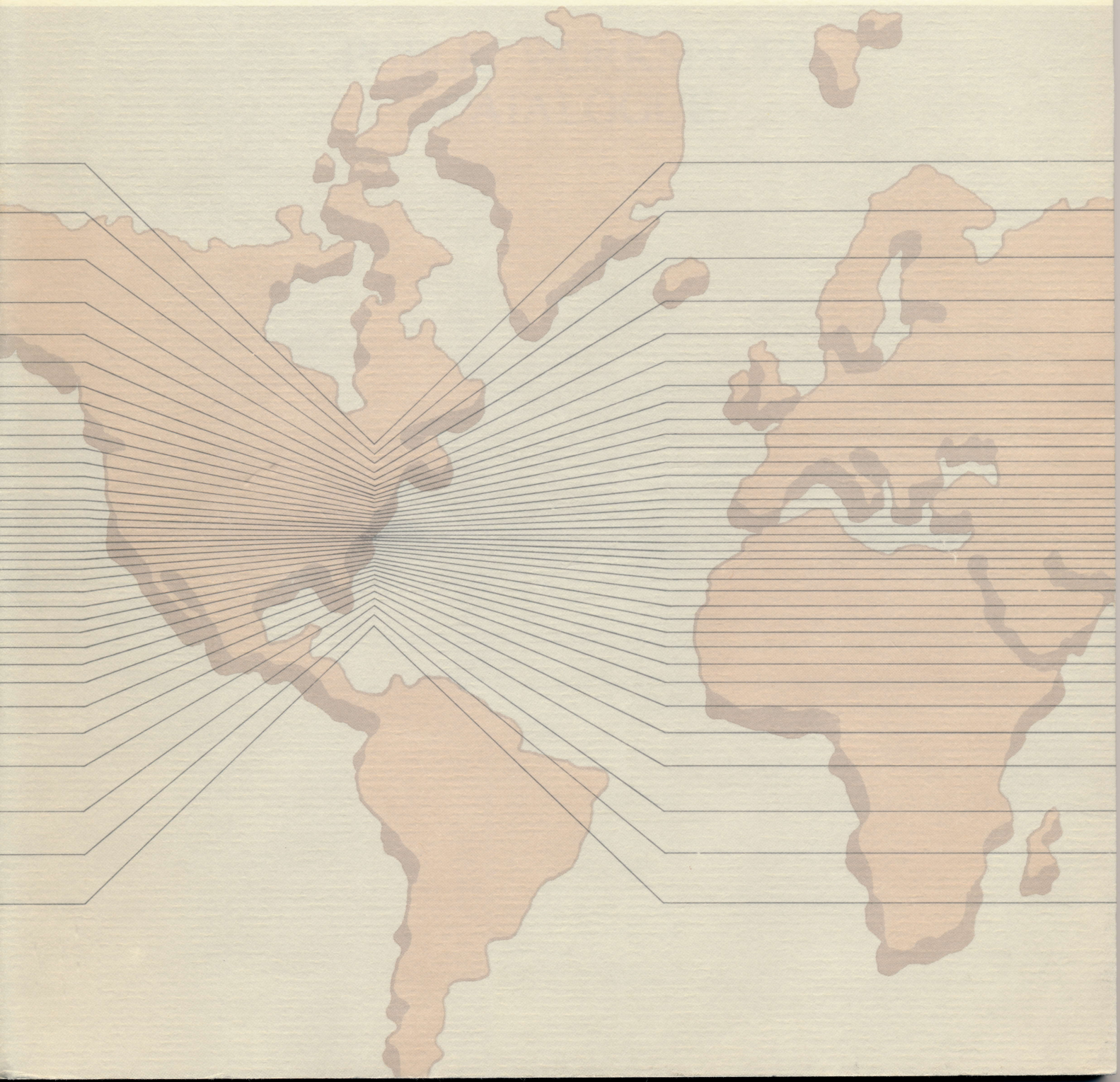
I. P. Sharp Associates

Public Workspaces Catalogue



PUBLIC WORKSPACES CATALOGUE

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PREFACE

What This Book Is About

This book catalogues fully supported **public workspaces** available to users of I.P. Sharp's SHARP APL timesharing service, and available under license to in-house SHARP APL installations. Each of these workspaces is briefly described: its purpose, contents, and documentation.

The SHARP APL public workspaces give access to the **utility and application software** provided and warrantied by I.P. Sharp.

What This Book Is For

This book briefly describes public workspaces on the SHARP APL system. These descriptions are intended to give you an overview of I.P. Sharp utility and application software. The description of each workspace should tell you whether and how the workspace meets your needs, and where and how you can find out more.

Each workspace's description includes: a statement of what you'd use the workspace for (that is, the workspace's *purpose*); a description of the most important *contents* of the workspace; and a list of *documentation* on the workspace.

Whom This Book Is For

This book is for users of SHARP APL. If you're a user, you should find this book interesting and useful, no matter how much or little APL you know. Although some of the software catalogued here is for highly sophisticated APL programmers, most of it requires no more special knowledge of SHARP APL than how to sign on and off, and how to load a workspace. The description of each workspace is written for the appropriate audience.

How to Use This Book

The first thing in using a reference book is to find out what it contains; the chief source of this information is the Index, at the back of the book. This alphabetically lists workspace names, product names, and keywords.

There's also a Table of Contents at the front of the book. The Table of Contents forms a more or less complete list of the fully supported public workspaces.

Organization: The bulk of this book is made up of workspace descriptions. These descriptions are sequenced *numerically* by library number and then *alphabetically* by workspace name; but the Index is a useful way to find a workspace by its name.

How to find information: *If you know the library and name* of a workspace, you can look it up directly—in the Table of Contents at the front, or by thumbing through the book.

If you know the name but not the library of a workspace, you can look up that name in the Index, at the back of the book.

If you know what you need but not if any workspace meets that need, you can look up the appropriate keyword in the Index, and be directed to appropriate workspace or workspaces. For example, if you look up *regression*, you'll be directed to `32 FILEREG`, `32 REGRESSION`, and `32 STEPWISE`.

The SHARP APL public workspaces give access to the utility and application software provided and warrantied by I.P. Sharp. These workspaces, and the software accessible through them, are available to users of I.P. Sharp's SHARP APL timesharing service, and are available under license to in-house SHARP APL installations.

A saved workspace is, among other things, a bundle of programs and data (that is, defined functions and global variables) that you can explicitly **load** into your active workspace. For example, you would load the workspace `39 MAGIC` thus:

```
      )LOAD 39 MAGIC
SAVED  20.38.28 01/04/82
```

The *SAVED* message tells you when the workspace was last saved; in this case, 1982 January 4 20:38:28 UTC.

Saved workspaces are organized into **libraries**; saved *public* workspaces into **public libraries**. A workspace is known by its **workspace identifier**; for example, `43 LINPROG`. This identifier has two parts: the **library number** (in this case, `43`); and the **workspace name** (*LINPROG*). For a comprehensive discussion of workspaces and workspace libraries, see the *SHARP APL Reference Manual.*

Public Libraries

This book catalogues libraries 1 through 128: these are the public libraries fully supported by I.P. Sharp.

You can list the workspaces in a public library, by using the *)LIB* system command. For example:

```
      )LIB 1
APL82      ARBOUT     BTASKREQ   DATABASES  DIRECTDEF  FILEAID    FILEPRINT
FILESORT   FORMAT     HSPRINT    LOCKSMITH  NETWORK    NEWS       PUBLICLIBS
REFERENCE  SATN       SATN41     TS         USAGE      WSFNS
```

(Note that such a list shows only the 11-character workspace names.) By contrast, you can't use *)LIB* on any private library but your own.

Libraries 1-128. The placement of workspaces in libraries 1-128 is to some extent a product of history; for instance, MAGIC is grouped with time series workspaces rather than with data base software because, when it was first developed, its sole use was for time series.

Nonetheless, libraries 1-128 can be organized into these general categories:

	Library
Utilities	1 System utilities and information 2 Auxiliary utilities and information 3 Graphical utilities 4 Text processing 5 Terminal utilities 6 Workspace utilities 7 Programming utilities

APL education	11 General 12 I.P. Sharp course material 13 Examples 15 *Management Problem-Solving with APL*
Mathematics	21 General 22 Extraction of roots 25 Matrices 26 Functions 27 Differential equations
Statistics	31 General 32 Regression analysis 33 Probability 34 Analysis of variance 35 Multivariate analysis 39 Time series analysis
Management	43 Linear programming 44 Risk analysis 45 Simulation 48 Project network
Financial data bases	51 *Financial Post* data bases 54 Banking data bases 55 RETRIEVE
Financial analysis	56 General 57 Capital investment modelling 59 Financial statement analysis
Engineering	64 Engineering mathematics
Data bases	81 General 85 Utilities 86 Systems 87 CONSOL 88 Management systems
Fun and games	91 Miscellaneous 92 One-player games 93 Recreational mathematics 95 Recipes
Industry-specific software	121 Energy 123 Life insurance 128 LESSOR

Other Public Libraries. When a release of a software product is superseded by a new release, the "old" workspace is transferred to library 499. There it remains until it is no longer used.

Libraries 500-999. When a new product or a new release of an old product is made available but is not ready for formal release, it is called a **preliminary release**. Such a release is usually stored in its "home" library plus 500; for example, a preliminary release of 39 *BAREMAGIC* would be stored in 539 *BAREMAGIC*.

666 *BOX* is the only workspace in a library above 500 that's described in this book. 666 *BOX* contains I.P. Sharp's corporate implementation of the SHARP APL Message Processing Facility (MAILBOX); it is not a completely public workspace. However, we've made an exception by documenting it, because many I.P. Sharp customers are enrolled in this version of MAILBOX, and because MAILBOX is in and of itself an important application software product.

Public Data Base Gateways

Several public workspaces are "gateways" to public data bases. These workspaces in libraries 0-128 are:

```
 11 BIBLIOGRAPH
 39 MAGIC
 51 FP
 51 FPAM
 51 FPNY
 51 FPPLOT
 51 FPREPORTS
 54 ABANKS
 54 MBANKS
 54 QBANKS
 54 WBANKS
 55 RETRIEVE
 81 CSUSAGE
 81 CURRENCY
 81 IFSUSAGE
121 ARGUS
121 IMPORTS
121 PETROSERIES
123 ACT
```

As well, for historical reasons, there are gateway workspaces in libraries 623, 702, 760, 950, 1674705, and 3416327. For more information about I.P. Sharp's public data bases, see the *Public Data Bases Catalogue*. The Appendix at the back of the *Public Workspaces Catalogue* gives the data bases you can access through each of the above workspaces, and *vice versa*.

I.P. Sharp-Supported Software

The I.P. Sharp utility and application software catalogued in this book meets these criteria:

§ The software is the property of I.P. Sharp.
§ It is provided and warrantied by I.P. Sharp.
§ It is freely available to any user of I.P. Sharp's SHARP APL timesharing service.
§ I.P. Sharp charges no special fee for use of the software on the timesharing service.
§ It is available under license to in-house SHARP APL installations.

The software is the property of I.P. Sharp. This means that use without I.P. Sharp's permission is illegal. I.P. Sharp freely authorizes all use of this software on line to the SHARP APL timesharing service. To ask about licensed use of this software, contact your I.P. Sharp representative.

The software is fully supported by I.P. Sharp. This means that I.P. Sharp considers the software to be tested, documented, and maintained; I.P. Sharp endeavours to keep this software free of bugs.

The software is freely available to all users of I.P. Sharp's SHARP APL timesharing service. The software catalogued in this book is available to all users. None of the workspaces described here is locked; any user can load them.

I.P. Sharp charges no special fee for timesharing users. You do not pay I.P. Sharp anything extra for using any public software on the timesharing service; that is, you're charged just the usual timesharing rates. Nonetheless, you have to pay royalty fees for a few data bases where the data base supplier imposes such a charge.

The software is available under license to any in-house SHARP APL installation. In practice, such installations have much of the software catalogued here. Some utility software catalogued in this book comes "bundled" (that is, at no extra charge) with SHARP APL. The workspaces described in this book that come bundled are:

```
1 ARBOUT
1 BTASKREQ
1 DIRECTDEF
1 FILEAID
1 FILESORT
1 FORMAT
1 HSPRINT
1 LOCKSMITH
1 NETWORK
1 NEWS
1 PUBLICLIBS
1 REFERENCE
1 SATN
1 SATN41
1 TS
1 USAGE
1 WSFNS
5 TERM
6 WSTRANSFER
```

(Customers with in-house SHARP APL running under MVS get three additional "bundled" workspaces: `1 TSIO`, `5 IBM3270`, and `5 UTIL3270`.)

The other application software products catalogued in this book may be licensed from I.P. Sharp for a fee. For more information, refer to the "SHARP APL Distributed Program Product Price List", or contact your nearest I.P. Sharp office.

I.P. Sharp gives you several ways to get information or other help about the software catalogued in this book:

§ I.P. Sharp provides local support around the world.
§ Most application software products are documented by one or more manuals.
§ Most public workspaces are "self-documented" on line.
§ Every major software product has an associated MAILBOX "query group".
§ You can enquire about public libraries on line.

Local Support

I.P. Sharp has more than fifty offices in North America, Europe, Australia, and the Far East. The consultants in these offices can help you select and then use SHARP APL application software, and can offer courses on many application software products.

For more information, contact your nearest I.P. Sharp office, or nearest I.P. Sharp regional headquarters:

Australia: I.P. Sharp Associates Proprietary Limited, 8th Floor, Carlton Centre, 55 Elizabeth Street, Sydney, New South Wales 2000; (02) 232-6366

Canada: I.P. Sharp Associates Limited, Box 418, Exchange Tower, 2 First Canadian Place, Toronto, Ontario M5X 1E3; (416) 364-5361

Europe: I.P. Sharp Associates Limited, 132 Buckingham Palace Road, London SW1W9SA, England; (01) 730-4567

Far East: I.P. Sharp Associates (S) Pte Ltd, Suite 1003, PIL Building, 140 Cecil Street, Singapore 0106, Republic of Singapore; 2210494

United States: I.P. Sharp Associates Incorporated, 1200 First Federal Plaza, Rochester, New York 14614; (716) 546-7270

Manuals

If an application software product can't be adequately described on line—as is often the case—it will have hardcopy, published documentation. Some *utility* software is described in SHARP APL Technical Notes (SATNs). Most *application* software of any complexity has a user's guide; sometimes it also has a summary brochure or a pocket-sized reference card.

A list of documentation published by I.P. Sharp for a workspace is given with that workspace's description in this catalogue. You can order any I.P. Sharp publication mentioned in this book: use the order form at the back of this book, or contact your I.P. Sharp representative.

SATNs are also available on line in workspace `1 SATN`.

Some application software is based on a book or article. Where such a book is relevant to a product, it is listed as a **reference**. I.P. Sharp does not, as a rule, keep these books in stock; exceptions are noted.

Online Documentation

Most public workspaces are "self-documenting". That is, you can load a workspace, and type *DESCRIBE* to get a general description of the workspace. For example:

```
      )LOAD 1 PUBLICLIBS
SAVED   3.08.11 08/10/81
      DESCRIBE
    I. P. SHARP'S APPLICATIONS LIBRARY IS LOCATED IN LIBRARIES 1
THROUGH 128.   IT CONSISTS OF ABOUT  200 APL  WORKSPACES AND MANY
PUBLIC DATA BASES.   WORKSPACE 1 PUBLICLIBS CONTAINS MATERIALS TO
ASSIST USERS OF THESE LIBRARIES.    THESE MATERIALS  (USUALLY APL
FUNCTIONS,  BUT  SOMETIMES  VARIABLES)  ARE LISTED IN  THE  TABLE
BELOW,   TOGETHER  WITH  NAMES    OF  ITEMS  CONTAINING  DETAILED
DOCUMENTATION ON THESE MATERIALS.

    FROM TIME TO TIME,  NEW CAPABILITIES WILL BE ADDED TO   THIS
WORKSPACE,  AND  THE LIST BELOW  WILL  BE  EXTENDED.    COMMENTS,
REQUESTS  FOR  ADDITIONAL  INFORMATION,   OR SUGGESTIONS  FOR NEW
CAPABILITIES SHOULD BE DIRECTED TO THE SYSTEM LIBRARIAN,  WHO MAY
BE REACHED AT:

                I. P. SHARP ASSOCIATES LIMITED
                BOX 418, EXCHANGE TOWER
                2 FIRST CANADIAN PLACE
                TORONTO, ONTARIO, CANADA
                      M5X 1E3

                TEL: (416) 364-5361

                (ADDRESS CODE SYSL ON THE I. P. SHARP
                MAILBOX SYSTEM).


ITEM        DOCUMENTATION          DESCRIPTION

LIB         LIBHOW          LIBRARY NUMBER - WS NAME CROSS-REFERENCE

FNS         FNSHOW          WS NAME - FUNCTION NAME CROSS-REFERENCE

DEMO        DEMOHOW         INFORMATION ON RUNNING DEMOS OF PROGRAMS

            ORGANIZATION    ORGANIZATION OF APPLICATIONS LIBRARIES
```

If a workspace has been changed since its manual was published, the workspace may also contain an object called *ΔDESCRIBE*, which contains or returns a description of the changes.

If a workspace contains a rapidly evolving system, it may also contain a news service, which can display short articles on changes etc.; just type *NEWS* in the workspace.

If a workspace contains a number of defined functions that you use individually, there may also be separate descriptions of these functions in objects named *fnameHOW*, where *fname* is the function name; for example, function *MEDIAN* (in 31 *DSTAT*) is described by an object named *MEDIANHOW*.

MAILBOX

You can often get information or other help about I.P. Sharp's system, utility, and application software through the I.P. Sharp Message Processing Facility, MAILBOX. (You have to be enrolled in MAILBOX to use it.)

Each major application software product has a MAILBOX **query group**. A product's query group includes only specialists in that product, usually just I.P. Sharp staff. You can send questions to the query group; I.P. Sharp staff read their mail frequently, so you can expect a prompt reply. If there's no query group for a product or workspace, just send your questions about the workspace to the System Librarian, *SYSL*.

These are some of the query groups in MAILBOX:

Product	Query group
ACTPAK	*ACTQ*
Box-Jenkins	*STATQ*
CONSOL	*CNSLQ*
Data bases	*DATA*
EASY	*STATQ*
Forecasting products	*STATQ*
Graphics products	*GRAFQ*
GRAPHREQ	*GREQQ*
HSPRINT	*HSPQ*
LESSOR	*LEASQ*
MABRA	*MABQ*
MAGIC	*MAGQ*
MAILBOX	*STEW*
Project management products	*PROJQ*
SAGA	*SAGAQ*
SNAP	*PROJQ*
STARS	*STARQ*
Statistical products	*STATQ*
SUPERPLOT	*SUPQ*
WSDOC	*WSDOC*
X-11	*STATQ*

For more information about MAILBOX, contact your I.P. Sharp representative.

Online Enquiry about Public Libraries

You can get up-to-date information on line about public workspaces that are described in this catalogue, in workspace `1 PUBLICLIBS`. You can use the functions in this workspace to list the workspaces in a library, to find and describe a particular workspace, and to locate a particular function.

Comments

Most SHARP APL application software has been developed in response to requests and suggestions from I.P. Sharp customers. I.P. Sharp's users continue to shape application software. If you have any ideas or suggestions for existing or potential software, I.P. Sharp would like to hear them: contact your

I.P. Sharp representative; send a MAILBOX message to the System Librarian, *SYSL*; or write to I.P. Sharp on the comment sheet at the back of this book.

1 *APL82*

You use this workspace to submit abstracts to the program chairman of the APL 82 Conference. APL 82 is to be held at Heidelberg 26–30 July 1982.

Note: This workspace will be dropped, and new workspace 1 *APL83* saved in July or August 1982.

Documentation:
Online *DESCRIBE*

1 *ARBOUT*

This workspace contains the defined function *ARBOUT*. You use *ARBOUT* to transmit arbitrary output; this allows you to take advantage of the special features of a particular terminal; for example, forms feeding, tabbing, ringing of bells, or, in more complicated cases, control of the operation of a graphics device. The special codes which activate these features can be transmitted using *ARBOUT* even if they do not correspond to any APL symbol. These codes are usually described in the terminal's operations manual.

This workspace also contains four tables, one for each terminal keyboard overlay convention presently supported in SHARP APL, showing standard interpretations (if any) for each bit combination which can result through use of *ARBOUT*.

Documentation:
Online *DESCRIBE*
SHARP APL Reference Manual

1 *BTASKREQ*

This workspace contains functions you can use to submit or withdraw a request for a B-task (*b*atch *task*), and to display such a request's status.

When the system satisfies your request for a B-task, it starts a workspace you specified in the request, without an associated terminal. This is cheaper than executing the workspace as a T-task (*t*erminal *task*) since B-task CPU rates are lower and there are no connect-time or character charges.

Documentation:
Online *DESCRIBE*
SATN-4 "N-tasks and B-tasks"
SATN-5 "Batch APL"
Batch Tasks in SHARP APL
SHARP APL Reference Manual

1 *DATABASES*

This workspace contains an online version of the *Public Data Bases Catalogue*, which contains up-to-date information on all I.P. Sharp public data bases.

This workspace also contains a data base applications library; that is, a collection of programs illustrating the use of these data bases.

Documentation:
Online *DESCRIBE*
HELP facility under program control
Public Data Bases Catalogue

1 *DIRECTDEF*

This workspace contains functions you can use for direct definition of other functions.

Direct definition is a method of defining functions which is coming into wide use in APL programming and in documentation. The material in this workspace defines the method, provides functions to translate from direct to canonical form, and suggests further sources of information on the use of direct definition.

Documentation:
SATN-36 "Direct Definition"

1 *FILEAID*

This workspace contains auxiliary functions to help you use SHARP APL files. Included are functions to set file access matrices, to

decode the timestamp in the component information, and, inversely, to encode time values.

Documentation:
Online *DESCRIBE*
SHARP APL File System
SHARP APL Reference Manual

---

1 *FILESORT*

This workspace contains the *SORTREQ* facility; that is, a set of functions you can use to specify, submit, or withdraw a request for a batch file sort; and to display such a request's status.

Sort requests are queued and from time to time are executed *en masse* by the system. If you're willing to wait possibly several hours for the file to be sorted, you'll get your results for a much lower cost than you would for an immediately executing APL program (see 85 *APLSORT*).

Documentation:
Online *DESCRIBE*
SATN-10 "*SORTREQ*"

---

1 *FORMAT*

This workspace contains defined functions complementary to system function □*FMT*.

□*FMT* forms a formatting facility; that is, it gives you a simple, economical, and adaptable means of producing reports involving tabular formatting of numeric and character data.

Workspace 1 *FORMAT* contains complementary functions to □*FMT* to help you with such things as aligning table headings, and numerous examples of the formatting facility.

Documentation:
Online *DESCRIBE*
SHARP APL Report Formatting
SHARP APL Reference Manual
Report Formatting (brochure)

---

1 *HSPRINT*

This workspace contains the *HSPRINT* facility; that is, functions you can use to submit and monitor a request to produce the contents of a SHARP APL file at an I.P. Sharp office. This facility means that you need not be restricted to the lower output speed of your terminal when printing large volumes of data.

You can control several parameters, including the number of copies (by repetition, or use of multipart forms), specification of six or eight print lines per vertical inch, vertical format control, and choice from a range of forms types, including special user-supplied forms. In addition, you can specify one of three character sets: *PN2* (an IBM character set suitable for PL/I), *FAST* (APL characters only), and *FULL* (both APL and ASCII characters). *HSPRINT* allows any APL value to be printed, and the result is similar to that obtained on a terminal. You can also specify output destination (I.P. Sharp Data Centre printer, a printer at a "remote" I.P. Sharp office, a magnetic tape, or a SHARP APL file), concatenation of files within a single print request, and optional decollation.

HSPRINT requests may be submitted interactively, or automatically under program control, and functions are provided to interrogate the *HSPRINT* request queue or withdraw requests. The queued requests are processed several times per day and the output is delivered in compliance with delivery instructions that are part of the print request.

Documentation:
Online *DESCRIBE*
SATN-8 "*HSPRINT*"

---

1 *LOCKSMITH*

This workspace tells you how you can regain access to a file or workspace you've locked yourself out of.

Documentation:
Online *DESCRIBE*

1 *NETWORK*

This workspace contains information about the I.P. Sharp Network. Local access telephone numbers are provided for more than 350 cities. Signon procedures are described for networks with which the I.P. Sharp Network is connected: namely Telenet, Tymnet, Datapac, PSS, and Telex.

Documentation:
Online *DESCRIBE*

1 *NEWS*

This workspace contains news about SHARP APL, the I.P. Sharp timesharing service, and I.P. Sharp Associates. It is used to inform I.P. Sharp customers of system enhancements, current operating schedule, and branch office addresses.

Documentation:
Online *DESCRIBE*

1 *PUBLICLIBS*

This workspace contains functions you can use to locate objects in the SHARP APL public libraries and their supporting documentation; and to remain up to date on library changes. It contains functions to search for particular object or workspace names.

Documentation:
Online *DESCRIBE*

1 *REFERENCE*

This workspace contains online information about SHARP APL in the form of an expanded "reference card". The workspace contains several tables, such as a list of file access permission codes, a summary of *HSPRINT* specifications, and so forth. The information is intended for reference by users that already understand the use of the system, not as tutorial material for new users. Not only can you select an entire table of information, but, in most cases, there's a detailed search facility to help you select the facts you need, and to print only those.

Documentation:
Online *DESCRIBE*

1 *SATN*

This workspace contains functions you can use to display at your terminal the titles, summaries, or text of SHARP APL Technical Notes (SATNs).

SATNs are designed to notify SHARP APL users of new system features. They are technical and terse, with few examples or guidelines. However, an experienced SHARP APL user should be able to put the new capabilities to work after a little experimentation.

Printing SATNs at your terminal is an expensive way to produce them. You can get a hard copy of any SATN from your I.P. Sharp representative.

Documentation:
Online *DESCRIBE*

1 *SATN*41

This workspace contains the functions *TH* and *THORN*, either of which produces the character representation of an enclosed array.

This workspace will be dropped when the primitive format function (⍕ 'thorn') is redefined for enclosed arrays.

Documentation:
Online *DESCRIBE*
SATN-41 "Composition and Enclosure"

1 *TS*

This workspace contains functions you can use to manipulate the timestamps returned by system functions □*TS*, □*WS*, and □*RDCI*.

System timestamps are reported in UTC (coordinated universal time). Function *LTS* in this workspace converts UTC timestamps to the time local to your node on the I.P. Sharp Network. To facilitate this conversion, a data base is maintained containing local offsets from UTC for most locations served by the I.P. Sharp Network.

Documentation:
Online *DESCRIBE*
SATN-29 "System Time and Timestamps"

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1 *USAGE*

This workspace contains the Usage Inquiry System: a set of functions you can use to retrieve and report information about your usage of the SHARP APL system. There are five categories of cumulative information (with an indicator of the time of the last update in each category) for each month: storage (workspaces and files), session values (CPU and connect times for each of T-, N-, and B-tasks, and character count for T-tasks), and *FILEPRINT*, *HSPRINT*, and *FILESORT* information. The storage category provides snapshot values taken at the time of last update. You can also produce an annotated signoff history report. Several months of data are kept on line.

Documentation:
Online *DESCRIBE*
SATN-9 "Usage Inquiry System"

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1 *WSFNS*

This workspace contains a set of workspace utility functions (such as *CLEAROUT* and *WALKAWAY*) and some useful special character variables (such as RETURN, LINEFEED, BACKSPACE, and IDLE).

Documentation:
Online *DESCRIBE*

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2 *SCAN*

This workspace contains documentation and examples of functions derived from the scan operator; that is, functions of the form $\circ\backslash\omega$, where $\circ$ is any APL primitive which can be used in a reduction (for example, $+/\omega$ and $+\backslash\omega$). In fact, scans are cumulative reductions (for example, `+\1 1 1 1` is `1 2 3 4`). Scans can often be applied to eliminate time-consuming program loops and simplify program structure, and are well worth the effort expended in learning their usage.

Documentation:
Online *DESCRIBE*
I.P. Sharp Newsletter, Technical Supplement 40, May/June 1976

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2 *UTILITY*

This workspace contains utility functions, such as: *DATE* and *TIME* to produce the character representation of the current date and time; *CPU*, which returns CPU usage since signon; and *CPUTIME*, which returns CPU usage between successive executions of *CPUTIME*.

Documentation:
Online *DESCRIBE*

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3 *GRAPHICS*

This workspace contains the SHARP APL Graphics Package, which you can use to build graphic applications.

The package is device-independent. It includes tools to aid graphic input, create pictures (graphic objects), and manipulate them. Graphic objects are represented and manipulated in familiar APL ways: sets of points (with or without connecting lines) are treated conceptually the way APL treats scalar values.

Documentation:
Online *DESCRIBE*
SHARP APL Graphics

References:
Newman and Sproull, *Principles of Interactive Computer Graphics* (McGraw-Hill, 1973)

3 *GRAPHREQ*

This workspace contains GRAPHREQ, I.P. Sharp's graphics request facility. You can use GRAPHREQ to have plots produced on a remote device; for instance, at an I.P. Sharp office.

Documentation:
Online *DESCRIBE*
GRAPHREQ User's Guide
GRAPHREQ Operator's Guide

3 *PLOT*

This workspace contains the SHARP APL PLOT facility: a set of easily used programs designed to present numeric results as graphs composed of usual APL characters. It provides options controlling the type of graph (histogram or curve), the number of functions to be plotted together, titling, scaling, and printing of axes, choice of plotting characters, and destination of results (printed on the terminal, saved in a variable for further processing, or inserted into a file). Normal usage results in plots consisting entirely of APL characters, which means that PLOT can be used on any terminal equipped with an APL character set. For Selectric-type terminals with a high-resolution graphic type element (for example, IBM type element 114), the *FINEPLOT* mode can be entered.

Documentation:
Online *DESCRIBE*
SHARP APL Plot Facility

3 *SAGA*

This workspace contains SAGA.

The *S*HARP *A*PL *G*raphics *A*ids are for APL systems designers writing computer graphics applications. SAGA offers basic tools for drawing lines, shading areas, and printing text, with detailed control over such things as placement, line style, and pen colour. SAGA commands are device-independent and are implemented for most commonly available plotting devices and hardcopy print-wheel terminals.

Sophisticated, customized graphics systems pass data to SAGA for display. In this way, SAGA provides a logical, device-independent interface that lets you concentrate on implementing high-level functions.

Documentation:
Online *DESCRIBE*
SAGA Reference Manual

3 *SUPERPLOT*

This workspace contains SUPERPLOT: a business graphics package that produces plots on a wide variety of plotting devices and terminals. Even if you are unfamiliar with computers, you can use SUPERPLOT to produce dramatic and effective plots. You can create straight- or curved-line plots, bar charts, histograms and stacked histogram plots, high-low-close plots, and log plots. You can plot many lines on the same graph using line styles or colours for differentiation; alternatively, data with a vastly different scale can be "split" out onto an associated graph. Any of these can be done with or without shading or grid lines. You have complete control over the colour and size of textual information on your plots—titles, footnotes, legends, and labels. You can specify how you want the plot to look in a conversational mode by answering a series of user-friendly prompts, or in program definition mode (for the more experienced user).

SUPERPLOT is MAGIC-compatible. When plotting time series, SUPERPLOT takes care of the timeframe labelling automatically.

The devices supported by SUPERPLOT include video display terminals, many hardcopy terminals, and flatbed plotters. Some flatbed plotters are able to draw multicolour plots

directly on overhead transparencies suitable for making presentations with.

Documentation:
Online *DESCRIBE*
SUPERPLOT (brochure)
SUPERPLOT User's Guide
SUPERPLOT Reference Card
MAGIC User's Manual

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4 *CHARACTER*

This workspace contains the very powerful *CH* function from EDIT, which you can use to modify text. *CH* is self-contained, so you can copy it from this workspace.

Documentation:
Online *DESCRIBE*
SHARP APL Text Editor

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4 *EDIT*

This workspace contains the SHARP APL Text Editor, EDIT: a facility that you can use to enter, modify, and format text. Two typefaces may be used (APL and Courier). The raw text may be stored in the workspace, or, when lengthy, in files: the package provides easy access in either case. You can direct edited output to a high-speed printer rather than to a terminal.

Documentation:
Online *DESCRIBE*
SHARP APL Text Editor

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4 *READABILITY*

This workspace contains functions you can use to compute the Flesch Readability Index of English-language text. This index is based on the number of sentences, words, and syllables in the text, and ranges from 0 (utterly incomprehensible) to 100 (extremely readable).

Documentation:
Online *DESCRIBE*

Reference:
R. Flesch, *The Art of Readable Writing* (1949)

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5 *DIABLO*

This workspace contains functions you can use to demonstrate the Diablo 1550-, 1620-, and 1700-series communications terminals.

Documentation:
Online *DESCRIBE*

Reference:
ASCII Communications Terminal Product Description (Hayward, California: Diablo Systems Inc.)

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5 *FONT*

This workspace contains: a listing of the APL characters, to enable users on a non-APL terminal to establish a correspondence; and a set of "cover functions" for APL primitives.

Documentation:
Online *DESCRIBE*

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5 *IBM*

This workspace contains functions you can use to test the operation of an IBM 2741 communication terminal (either correspondence or BCD) in order to detect malfunctions. You can also use these functions to determine the quality of the connection from terminal to central computer, regardless of terminal type.

Documentation:
Online *DESCRIBE*

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5 *TERM*

This workspace contains functions that describe the terminal types you can specify in the)*TERM* system command.)*TERM* sets the parameters used by the SHARP APL system

in formatting and interpreting terminal input and output to the values best suited to the terminal specified.

Documentation:
Online *DESCRIBE*
SATN-28 "Terminal Control"

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5 *TRENDATA*

This workspace contains functions you can use to demonstrate the Trendata 4000 communications terminal.

Documentation:
Online *DESCRIBE*

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5 *TY33FNS*

This workspace contains "cover functions" for some SHARP APL primitive and system objects you can't enter from a Teletype 33; for example, *NOT* for ∧, and *FREAD* for ⎕*READ*.

Documentation:
Online *DESCRIBE*

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6 *WSTRANSFER*

This workspace contains a facility intended to transfer APL workspaces between installations. A transfer format (involving transfer of the workspace in source form, as character strings) was agreed to by most APL implementors in May 1976. The SHARP APL implementation conforms to (and extends where necessary) the convention. The programs are available to all installations and have been written with a view to straightforward conversion to other systems.

Documentation:
SATN-22 "APL Workspace Transfer"

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7 *FNED*

This workspace contains an extended function editor you can use when you find the "primitive" APL function editor insufficient. *FNED*'s facilities include string searching, text insertion, and text replacement. It is especially useful for very long lines of code, which may exceed your terminal's print width.

Documentation:
Online *DESCRIBE*

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7 *WSDOC*

This workspace contains WSDOC, a workspace documentation system you can use to list the functions and environment of a user's workspace.

WSDOC summarizes a workspace's environment, producing a one-line summary of each function, variable, and package in the workspace; a display of each function; a cross-reference of each object used within a function; a global cross-reference of all objects used within the workspace; and a list of functions called by each function. You can request as much of this information as you want for each workspace, and you can also control such things as the size of the page, and whether the report is to be printed at your terminal or on a high-speed printer.

Documentation:
Online *DESCRIBE*

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7 *XREF*

This workspace contains functions you can copy into another workspace and use to produce a cross-reference table of the objects referenced in one or more user functions. Cross-referencing is a valuable aid in program correction, development, and documentation. The user functions are examined and tables are produced which contain each identifier, the line numbers on which it was found, and the types of references located (for example, statement label, function or variable call, variable specification, or subscripted reference to a variable). The table may be printed directly

at the terminal, or, when cross-referencing one function at a time, returned as an explicit result which could be further processed by appropriate user-supplied functions.

Documentation:
Online *DESCRIBE*

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11 *ADVANCEDEX*

This workspace contains 32 well documented APL functions provided by IBM as examples of APL programming for the beginner. However, some of these are useful utility functions of interest even to experienced programmers.

Documentation:
Online *DESCRIBE*

Reference:
APL Language [IBM form C26-3847]

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11 *APLCOURSE*

The beginner in APL will find the exercises in this workspace helpful in his study of the language. You can use the functions *TEACH* and *EASYDRILL* to select the APL operations you would like to practise. You meet problems involving those operations, solve them, and type in the answers and receive an evaluation. The exercise continues until you wish to stop. You are then given an analysis of your progress.

Documentation:
Online *DESCRIBE*

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11 *BIBLIOGRAPHY*

This workspace is a gateway to the APLBIB data base. For more information, see the *Public Data Bases Catalogue.*

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11 *CLASS*

This workspace accompanies the text *APL: An Interactive Approach*; it contains some of the programs used in the examples so that you can experiment with them.

Reference:
L. Gilman and A.J. Rose, *APL: An Interactive Approach* (New York: Wiley, 1976) [available from I.P. Sharp]

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11 *PAKINTEXT*

This workspace accompanies *APL: A Short Course.*

Reference:
Sandra B. Pakin, *APL: A Short Course* (Prentice-Hall, 1973)

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12 *COURSE*

This workspace accompanies I.P. Sharp's introductory APL course, *A Working Introduction to APL.*

Documentation:
Online *DESCRIBE*

Reference:
A Working Introduction to APL (Toronto: I.P. Sharp Associates, 1981)

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13 *NATIONS*

This workspace is designed to convey a number of fundamental APL concepts by way of a simple, clear demonstration suitable for people of diverse backgrounds. When you see APL for the first time, a demonstration of the power of APL primitives probably seems to you remote and technical, with little direct connection to the problems that the computer might help you solve. It is better to show you some simple running functions, the purpose and use of which you can instantly understand. To complement these functions, the data should be familiar, yet large enough to be nontrivial. It must be possible to do some surprising or interesting calculations off the cuff.

This workspace deals with geographical information (countries, capitals, populations, locations, distances, etc.). Such data, and common ways to manipulate it, are familiar enough that there is little explanation necessary. The focus can be on properties of the APL language and the SHARP APL timesharing system.

Documentation:
Online *DESCRIBE*

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13 *STARMAP*

This workspace contains STARMAP.
In many fields of science or commerce, it is possible to write APL programs which correspond directly to the basic terminology of the area. These defined functions in effect constitute a user language tailored to the particular field. Using them, application programs may be readily constructed from familiar terms. A highly modular style of programming simplifies the programmer's task, and makes it easy to modify the outer programs or adapt them for new applications. It also makes for programs that are easy to read as well as easy to use. Indeed, the programs may serve by their structure and organization to make clear to a student how complex tasks are organized.

STARMAP illustrates this approach to programming by discussing a single example in detail: a family of programs that draw a map of the sky showing the planets and the brighter stars as they appear above any place on Earth at any time in any day. The functions are written so as to make clear the structure of the underlying model, by providing formal executable definitions for a vocabulary of terms and concepts familiar in astronomy.

The maps may be produced on any terminal with an APL character set. If the terminal has graphics capability, maps of improved appearance may be produced, but at greater cost. There are alternate schemes for producing maps via graphic capabilities of terminals: a low-resolution and a high-resolution method.

Documentation:
Online *DESCRIBE*

Reference:
P.C. Berry and J.C. Thorstensen, *STARMAP* (APL Press, 1978) [available from I.P. Sharp]

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15 *CAPBUDGET*
15 *CAPSTRUCTURE*
15 *CASHMAN*
15 *COSTACCOUNT*
15 *CPM*
15 *CREDITMAN*
15 *DEPRECIATION*
15 *FINANAL1*
15 *FINANAL2*
15 *FORECAST*
15 *GENOR*
15 *GSTAT*
15 *INVENTORY*
15 *INVESTMENT*
15 *LP*
15 *PRICEINDEX*
15 *STAT*
15 *TIMEVALUE*

These workspaces accompany the text *Management Problem-Solving with APL*, a guide to the solution of typical accounting and finance problems through APL. The workspaces were developed at the Graduate School of Management of the University of California at Los Angeles. They are meant to give an impression of some kinds of management problems amenable to solution through man/machine interaction, as well as some of the advantages and disadvantages which may be derived.

Documentation:
Online *DESCRIBE*

References:
Buckley, Nagaraj, Sharp, and Schenck, *Management Problem-Solving With APL* (New York: Wiley, 1974)
Buckley and Lightner, *Accounting: An Information Systems Approach*

21 *GENERAL*

This workspace contains mathematical functions of general interest to the APL user. There are functions to solve cubic equations with real coefficients, evaluate determinants, and extract prime factors of natural numbers.

Documentation:
Online *DESCRIBE*

22 *REALROOTS*

This workspace contains functions you can use to find the real roots of single- or multiple-variable equations with real coefficients.

Documentation:
Online *DESCRIBE*

22 *ROOTS*

This workspace contains functions you can use to extract roots of an *n*th-order polynomial with real coefficients. Specifically, you can use these functions: to extract quadratic factors using the Bairstow method; to extract real roots using the Newton-Raphson method; to extract roots of cubic equation; to extract roots including residuals; to use the Aitken approximation; and to extract roots using the root-squaring method.

Documentation:
Online *DESCRIBE*

25 *EIGPAK*

This workspace contains functions you can use to find the eigenvalues of real matrices. The functions implement algorithms which have appeared in the Numerische Mathematik Handbuch series.

Documentation:
Online *DESCRIBE*

25 *FMATRIX*

This workspace contains functions that facilitate inversion, transposition, and multiplication of large matrices stored in files. These functions should be used only if the corresponding primitive functions induce a *WS FULL*.

Documentation:
Online *DESCRIBE*

25 *MATRIXALG*

This workspace contains the function *DET*, which finds the determinant of a square matrix over the field of complex numbers.

Documentation:
Online *DESCRIBE*

26 *INTEGRATION*

This workspace contains functions for the numerical integration of single-variable functions by Gauss-Legendre quadrature and trapezoidal rule approximations (using Romberg extrapolation).

Documentation:
Online *DESCRIBE*

Reference:
Conte and DeBoor, *Elementary Numerical Analysis: An Algorithmic Approach* (New York: McGraw-Hill, 1972)

26 *POLYNOMIALS*

This workspace contains functions for symbolic manipulation of polynomials; that is, the manipulation of polynomials as mathematical entities rather than from a purely numerical point of view. Multivariable polynomials may be treated. Operations provided are: addition, subtraction, multiplication, exponentiation, tests for equality, taking a partial derivative, and evaluation at a point. This workspace could be handy during work involving the

generation and simplification of complicated formulas, or as an educational tool.

Documentation:
Online *DESCRIBE*

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27 *HYBRID*

This workspace contains HYBRID, a continuous system simulator. You feed it a suitable representation of the equation(s) to be solved, and set up the initial conditions; and HYBRID provides tables of values or graphs depicting those aspects of the system's behaviour that are of interest.

The interface between you and HYBRID is reminiscent of hybrid computing. (Hybrid computing is a mixture of digital and analogue computing, stressing the advantages of each.) But no previous knowledge of analogue and hybrid computing, or even APL, is required: the hybrid approach is a convenient framework in which to describe and solve problems of continuous system simulation. You use simple English-like commands to describe the problem and specify the output. Models may be saved on a file for later reactivation. The workspace provides access to a file of examples to help you get started.

Documentation:
Online *DESCRIBE*

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27 *ODE*

This workspace contains functions you can use to solve first-order ordinary differential equations using the Runge-Kutta method and Merson's method.

Documentation:
Online *DESCRIBE*

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31 *CTAB*

This workspace contains functions you can use to perform two- or three-way cross-tabulations, and to produce various test statistics concerning contingency tables. The test statistics include *chi*-squares for contingency tables of various sizes, Cramer's statistic, the Fisher exact probability, and the Goodman-Kruskal *gamma* coefficient.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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31 *DSTAT*

This workspace contains functions you can use to compute descriptive statistics, such as sample size, mean, variance, standard deviation, standard error of the mean, mean deviation, median, maximum, minimum, range, mode, skewness, and kurtosis.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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31 *ENTRY*

This workspace contains functions you can use to enter numeric data easily, correct it, format it into tabular form, and print it with or without titles. A caption, multilined column headings, and row labels may be included. Conversational and nonconversational tabulation routines are available.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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31 *FREQUENCY*

This workspace contains functions for frequency classification of data, calculation of *n*-tiles, production of histograms and tables, and computation of parameters of best fit to normal, binomial, or Poisson distributions.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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31 *MISC*

This workspace contains functions for miscellaneous statistics; for example, weighted moving averages, rounding, and permutation and combination generators.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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31 *NONPARAMETRIC*

This workspace contains functions you can use to calculate a wide variety of nonparametric statistics; for example, binomial tests, analyses of variance, rank correlation coefficients, coefficients of concordance, tests for trend, change, runs and signs, and median tests.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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31 *PARAMETRIC*

This workspace contains functions you can use to calculate various parametric statistics. Specifically, you can: test the homogeneity of variances, by Bartlett's method; perform Duncan's test on a set of means; and perform linear comparisons among *t* population means, by Scheffe's method.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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31 *TTEST*

This workspace contains functions you can use to perform one- and two-sample t-tests, to compute the t-statistic for a single population, and to test the population mean when the variance is unknown.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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32 *CORRELATION*

This workspace contains functions you can use to produce correlation matrices, and simple and partial correlation coefficients.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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32 *FILEREG*

This workspace performs large-scale simple or multiple regression on data in SHARP APL files.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

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32 *LAGS*

This workspace contains functions you can use to perform both Almon (polynomial-distributed) and Shiller lag analyses, particularly on time series.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

32 *NONLINEAR*

This workspace contains functions you can use to compute parameters of multivariate nonlinear models using Marquardt's algorithm, which is a combination of the method of Gauss linearization and the method of steepest descent. Extensive statistical results may be obtained. As a special case, this workspace contains a function to evaluate parameters of the Gompertz equation.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

32 *NPE*

This workspace contains functions you can use to perform nonlinear parameter estimation for a general class of models. Models may be sets of simultaneous equations; that is, they may contain more than a single equation, and a particular parameter may appear in more than one equation. Equations within models may be multivariate and possibly nonlinear in their parameters or variables.

Gauss's method is used to calculate least squares of "full information maximum likelihood" (FIML) estimates of all parameters appearing in the model. Models may be specified in reduced form or in structural form, and inequality constraints may be imposed upon the estimation procedure. Selection of all options is controlled by state-setting functions.

Documentation:
Online *DESCRIBE*

Reference:
Yonathon Bard, *Nonlinear Parameter Estimation* (Academic Press, 1974)

32 *REGRESSION*

This workspace contains functions for simple and multiple regression. In addition to the fundamental least-squares routines, extensions include instrumental variables substitution, two- and three-stage least squares analyses of sets of simultaneous linear equations, and Cochrane-Orcutt, Hildreth-Lu, and generalized least squares autocorrelation adjustments. Optional output features for all programs are controlled by state-setting functions.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

32 *STEPWISE*

This workspace contains conversational programs which perform stepwise linear regression. Entry of variables into, or their removal from, the model may be under either program or user control. Data may be in the workspace or on file.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

33 *PROBDIST*

This workspace contains functions you can use to compute values from many common cumulative distribution functions and their inverses, and also values from some probability density functions. Those whose corresponding density functions are continuous include the *chi*-square, normal, *F*, Poisson, and *t* distributions. Those with discrete-density functions are the binomial and hypergeometric distributions, distributions of runs and matches, and the distribution of the signed-rank test.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

33 *RANDOM*

This workspace contains functions you can use to generate random samples from populations governed by the following distributions: Cauchy, exponential, type 1 extreme value, Laplace, logistic, normal, uniform, *beta*, *chi*-square (and noncentral *chi*-square), *F* (and noncentral *F*), *gamma*, geometric, hypergeometric, log-normal, negative binomial, *t* (and noncentral *t*), and Poisson.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

34 *ANOVA*

This workspace contains functions you can use to perform analysis of variance. Several of the functions have conversational counterparts to lead you step by step through an analysis, although noninteractive state-setting functions are also provided.

Included in this workspace are functions for the following types of experimental design: crossed or nested, one-way with unequal subclass numbers, three-factor experiments with Latin square design, *n*-factor experiments with more than one level per factor, blocked or completely random design, with or without missing values or replications, and with a standard or nonstandard error term, split plot or split-split plot designs with a completely random or a randomized complete block design. In addition, there is a function to produce means tables and profiles of factor interactions for *n*-factor experiments.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

34 *COVARIANCE*

This workspace contains functions you can use to perform analysis of covariance for a single variable of classification with several populations. Various statistics are produced and a number of hypotheses about the data are tested.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

34 *ORTHOGONAL*

This workspace contains functions you can use to analyse orthogonal factorial experiments with up to six factors, one of which may represent replications, and an arbitrary number of levels of each factor. The analysis of variance table gives the degrees of freedom, sum of squares, and mean square for each main effect and interaction term. Specified terms may be pooled to accommodate designs which are not complete factorials, such as split-plot designs. Orthogonal single degree of freedom contrasts may be calculated for any main effect or interaction term. Finally, a method is provided for obtaining the analysis of variance table for any crossed, nested, or partially nested design from an algebraic specification of the appropriate linear model.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

Reference:
K.W. Smillie, *Some APL Algorithms for Orthogonal Factorial Experiments* (Edmonton: University of Alberta, Department of Computing Science, 1969)

35 *DISCRIMINANT*

This workspace contains functions you can use to perform a discriminant analysis. The functions construct a framework by which multivariate observations can be classified into one of a set of prespecified populations. You

can specify the variables to be used in the analysis either directly, or have them selected in a stepwise manner. In either case, you can take either of two approaches to define the discriminating framework: you can minimize the mean probability of misclassification; or you can define "canonical variables".

An additional feature of the workspace allows you to classify any number of multivariate observations (of unknown origin) into one of the populations, once you've set up the discriminating framework.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

35 *PRINCIPAL*

This workspace contains functions you can use to perform two types of multivariate statistical analysis: a principal component analysis and a canonical correlation analysis. You can use either of these techniques to get a more parsimonious description of the variability which exists in multivariate data sets. The principal component analysis finds linear combinations of one set of variables which account for as much variance as possible within that variable set. The canonical correlation analysis finds linear combinations of each of two sets of variables with the aim of accounting for a maximum amount of the relationship between those two variable sets.

Both of these analyses can be based on a covariance matrix or a correlation matrix, either of which is estimated from the input data. The output of either analysis lists the coefficients of the corresponding linear combinations, starting with those combinations which provide the largest explanation of the variability inherent in the original data.

This workspace also contains functions you can use to evaluate the linear combinations at each of the original data observations, and to estimate the correlations between the original variables and the resulting linear combinations of these variables.

Documentation:
Online *DESCRIBE*
SHARP APL Functions for Statistical Analysis

39 *BAREMAGIC*

This workspace contains MAGIC: an easy-to-use and powerful system you can use to analyse time series data. MAGIC's user-oriented commands make it possible quickly to manipulate and display time series. No previous computer experience is required in order to use this system successfully. Using MAGIC's English-like commands, you can quickly perform detailed studies which might otherwise take several days to complete. Data can be displayed in tabular or graphical form. Using SUPERPLOT with MAGIC gives you an efficient way to quickly appraise your results. MAGIC can be used in "desk calculator mode", or in "program definition mode" if you want to define functions you can use repetitively.

You can think of MAGIC as a user-oriented macrolanguage geared specifically—but not exclusively—to time series analysis. Data manipulation programs cover arithmetic, statistics, and forecasting: the system has capabilities for cumulation, growth rate calculation, leading and lagging time series, moving average, polynomial fitting, regression, and X-11 deseasonalization. Most of these programs can work "in parallel" on multiple time series, the way APL primitives do on APL arrays. This capability allows elimination of many trivial details, which in turn allows specification of complex operations with few instructions.

Another important facet of MAGIC is that instead of having you operate under an imposed, rigid structure, it allows you to retain control, with wide choice over which macrolanguage building blocks to use and which to disregard.

You can also use this workspace as a gateway to your private CONSOL or WIZARD data bases.

Documentation:
MAGIC (brochure)
MAGIC User's Manual

39 *BOXJENKINS*

This workspace contains functions you can use to analyse and forecast time series by the Box-Jenkins method.

Autoregressive integrated moving average (ARIMA) models form the basis of the sophisticated and powerful methodology developed by G.E.P. Box and G.M. Jenkins. Practical applications of their technique are many and varied, and include sales forecasting, production planning, and the design of optimal control schemes for which the system must first be analysed and modelled.

The fundamental assumption underlying the technique as applied to a single time series is that future values for that series can be determined using the mathematical formulation (stochastic model) that has been shown to describe the past behaviour of the series. Given this assumption, the primary objective of a univariate Box-Jenkins analysis is to obtain a stochastic model that can be demonstrated to have generated the existing observations.

The method can be categorized into a logical succession of three distinct stages: model identification, model estimation, and forecasting based on the fitted model.

The SHARP APL implementation of the Box-Jenkins technique assumes no prior computer knowledge (but a good knowledge of the Box-Jenkins technique) and guides you through the entire process, from the model identification stage to the generation of forecasts. As well, the modular design of the package gives you direct access to any of the three stages.

Documentation:
Online *DESCRIBE*
Box-Jenkins in SHARP APL

Reference:
G.E.P. Box and G.M. Jenkins, *Timeseries Analysis: Forecasting and Control*, rev. ed. (Holden-Day, 1976)

39 *EASY*

This workspace contains EASY, I.P. Sharp's *E*conometric *A*nalysis *Sy*stem. EASY facilitates the quantitative analysis of time series, as commonly performed by economists and other social scientists. EASY brings together techniques ranging from simple regression to more complex models, which incorporate distributed-lag schemes, and corrections for time-dependent errors. But, most importantly, EASY's conversational style is designed to be used by a nonprogrammer: you and EASY communicate in the language of statistics, not that of the computer. The ability to modify equations interactively—adding or subtracting variables, or varying assumptions—lets you build up a model gradually. You can then save your equations for future recall and use. You can forecast figures beyond the estimation timeframe, or validate equations within the estimation timeframe by using the simulation capability.

Because EASY is part of I.P. Sharp's suite of time series manipulation packages, you can use it with the time series data in I.P. Sharp's public data bases, or in your own private data base; you can use SUPERPLOT to graph trends or residuals; and you can exploit MAGIC's manipulation and display capabilities.

Documentation:
Online *DESCRIBE*
EASY (fact sheet)
EASY (manual)

39 *MAGIC*

This workspace is a gateway to these data bases: ABSDATA, AGDATA, BIHIST, CANSIM, CDNBOND, CITIBASE,

CDNOPT, COMMOD, CURRENCY, FPCORP, FPSTOCK, HFO, IFS, IMPORTS, IPA, JSCHEDULE, LPGAS, MBANK, MER, MPS, MPSR, MRATE, NPAECO, OECD, QBANK, QOS, SD, SEDS, TSE300, UKCSO, UKET, USOPT, USCPI, USPPI, WBANK, WDEBT, WSB, and YBANK. For more information, see the *Public Data Bases Catalogue.*

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39 *MASSAGER*

This workspace contains SHARP APL Massager Plus: a set of functions you can use to calculate certain descriptive statistics, change of timeframe and series periodicity, calculation of correlation matrices and series autocorrelation, detrending, weighted moving sums, exponential smoothing, and linear interpolation.

Documentation:
Online *DESCRIBE*
SHARP APL Massager Plus

Reference:
M.C. McCraken, *Massager User's Manual*

39 *TRANSFERFNS*

This workspace contains functions you can use to analyse and forecast Box-Jenkins transfer function models. You use this workspace with 39 *BOXJENKINS*.

Documentation:
Online *DESCRIBE*
Box-Jenkins in SHARP APL

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39 *X11*

This workspace contains functions you can use to perform the seasonal adjustment of monthly or quarterly time series according to the X-11 variant of the Census Method II seasonal adjustment program. The algorithm, originally developed by the Economic Research and Analysis Division of the United States Bureau of the Census, incorporates the optimum features of the various methods available for the adjustment for seasonality of economic time series.

The fundamental assumptions underlying the techniques are that seasonal fluctuations in the original series are not only measurable but are separable from the other components of the series, namely the trend, cyclical, trading-day, and irregular components. The seasonal adjustment algorithm attempts to remove seasonal and trading-day variation, so that the final seasonally adjusted series consists of the trend-cycle and irregular components only.

This workspace provides many options as to reporting output and computation techniques.

Documentation:
Online *DESCRIBE*
X-11 in SHARP APL

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43 *LINPROG*

This workspace contains functions you can use to solve linear programming problems.

Linear programming problems can be input conversationally, in an easy and convenient manner, and an optimum result is calculated and printed. Alternately, the revised simplex routine itself can be used directly, accepting as input a numeric *A* matrix, and returning as a result an optimum basis and its associated levels of activity.

Documentation:
Online *DESCRIBE*

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44 *RISK*

This workspace contains a set of functions designed to help you quantify the risk element in investment ventures using the method propounded by John Cozzolino for calculating the risk-adjusted value of a project.

Documentation:
Online *DESCRIBE*

Reference:
John M. Cozzolino, *Management of Oil and Gas Exploration Risk* (Cozzolino Associates Inc., 1977)

45 *GENSIM*

Many of the problems of society, in particular those of energy use, involve extremely complex systems. Such complex systems are made up of many variables interacting with each other, reacting to changes in each other, etc. In studying mathematical models of complex systems, you often face a tradeoff between the precision of the model's predictions and the ability to obtain the detailed information needed to build the model. This workspace contains functions you can use: to build simple mathematical models of complex systems, using simple and weighted digraphs; and to analyse the conclusions attainable from such models, based on a minimal amount of information.

Documentation:
Online *DESCRIBE*

References:
F.S. Roberts, *Discrete Mathematical Models with Applications to Social, Biological, and Environmental Problems* (New York: Prentice-Hall, 1976) [the workspace description was adapted from this text]

F.S. Roberts, *Weighted Digraph Models for Energy Use and for Pollution in Transportation Systems*, Rand publication R-1578-NSF (Rand Corp., 1974)

48 *SNAP*

This workspace contains SNAP: a system for project planning and control. SNAP stands for *S*harp *N*etwork *A*nalysis for *P*rojects, and is so called because the relationships between the various activities of a project can be represented by a network, with paths leading from jobs that must be done first to those that come after, and ultimately to the completion of the project.

During planning, you break a project down into its constituent activities and specify the sequence in which they will be done. SNAP allows you to describe the project in terms of these activities, their durations and resource requirements, and their logical relationships. The logical relationships can also include overlaps and delays between certain activities.

SNAP also allows you to structure your project to reflect the different points of view and information requirements of the various participants in a project. You can break down a SNAP network into subnets, which normally follow the work breakdown structure. You can combine several activities within a subnet into a "superactivity" or hammock, and several events into a single "superevent" or milestone.

The network is then analysed in order to identify the critical phases of the project. The consequences of alternative strategies can be examined until a workable plan is reached.

As work progresses, the project needs to be monitored and controlled. SNAP has facilities to measure progress and compare this with expectations. This information then allows for corrective action if there are significant deviations from plan. All this helps you to anticipate difficulties in the project and to cope with them effectively.

SNAP is designed to be used by those with no APL experience. However, if you do know APL, you can put together your own customized version of SNAP using a set of SNAP utilities provided for you.

Documentation:
Online *DESCRIBE*
SNAP User's Manual
SNAP Reference Card
SNAP Fact Sheet

48 *SNAPUTILS*

This workspace contains the SNAP utility tools that could be used by an APL programmer to customize, modify, or extend SNAP.

Documentation:
Online *DESCRIBE*
SNAP User's Manual
SNAP Reference Card
SNAP Fact Sheet

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51 *FP*
51 *FPAM*
51 *FPNY*
51 *FPPLOT*
51 *FPCREPORTS*
51 *FPSTOCKLIST*

These workspaces are gateways to the FPSTOCK data base. For more information, see the *Public Data Bases Catalogue.*

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54 *ABANKS*

This workspace is a gateway to the YBANK data base. For more information, see the *Public Data Bases Catalogue.*

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54 *MBANKS*

This workspace is a gateway to the MBANK data base. For more information, see the *Public Data Bases Catalogue.*

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54 *QBANKS*

This workspace is a gateway to the QBANK data base. For more information, see the *Public Data Bases Catalogue.*

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54 *WBANKS*

This workspace is a gateway to the WBANK data base. For more information, see the *Public Data Bases Catalogue.*

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55 *RETRIEVE*

This workspace is a gateway to these data bases: CDNBOND, CDNOPT, COMMOD, FPCORP, JSCHEDULE, TSE300, and USOPT. For more information, see the *Public Data Bases Catalogue.*

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56 *BONDS*

This workspace contains functions you can use to analyse corporate and government bonds. There are functions to find current yield, yield to maturity (which includes capital gains effects from buying a bond at less than par value), and the price of a bond for a given yield to maturity. There is a function to calculate the premiums over conversion and straight debt value reflected in the market price of a convertible bond. Functions are available to convert the discount quoted on Treasury bills into the actual price paid, and the reverse. An auxiliary function is available to find the number of days between two dates.

Documentation:
Online *DESCRIBE*
SHARP APL in Financial Analysis

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56 *DEPRECIATE*

This workspace contains functions you can use to calculate depreciations of capital assets. The methods provided are: straight-line, sum-the-years-digits, simple declining balance, 150% declining balance, and double declining balance. The declining balance methods switch over to straight-line depreciation at that point in time, which optimizes tax savings. There is also a function to calculate the amount of the 7% investment tax credit for assets with a long expected life.

Documentation:
Online *DESCRIBE*
SHARP APL in Financial Analysis

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56 *GROWTH*

This workspace contains functions you can use to calculate an average growth rate, and growth over a given period to compare with the original data; and to produce a growth triangle showing average growth over any subset of the period involved.

Documentation:
Online *DESCRIBE*
SHARP APL in Financial Analysis

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56 *LEASE*

This workspace contains functions you can use to analyse the economics of cash payment, leasing, and borrowing as alternative means of financing the acquisition of long-term assets. It guides you step by step through a detailed analysis, leaving at the end a clean, readable report. Among the notable features of the program are facilities for handling leases with a buyout option, and choice from a variety of depreciation methods.

Documentation:
Online *DESCRIBE*
SHARP APL in Financial Analysis

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56 *ROR*

This workspace contains functions for computing rates of return on investments under general conditions. Prospective and retrospective rates of return and true rates of return with reinvestment of positive cashflows can be computed for any cashflows, subject to varying interest rates and nonuniform time sequences.

Documentation:
Online *DESCRIBE*
SHARP APL in Financial Analysis

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56 *TIMEVALUE*

This workspace contains functions you can use to calculate the present or future value of a single cashflow, an annuity in arrears or in advance, or an arbitrary sequence of cashflows, subject to interest which may vary over time.

Documentation:
Online *DESCRIBE*

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57 *CAPERS*

This workspace contains CAPERS.

CAPERS is designed to evaluate capital expenditure projects using the discounted cashflow method. For example, you can use CAPERS to analyse the economic feasibility of a plant expansion or a real estate development. For each project, you define the set of relevant economic parameters for each year of the project; for example: income, operating expenses, capital expenditures, depreciation information for tax purposes, and the applicable tax rate.

You can choose among a number of reports, ranging from a summary printout of profitability indicators to a multipage detailed printout.

CAPERS' data management facility lets you store sets of input data for several projects or different scenarios for a single project. This makes it easy for you to run many alternate scenarios by modifying a single base case.

Documentation:
Online *DESCRIBE*

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59 *ANALYSIS*

This workspace contains functions you can use to analyse financial statements. The input comprises 21 vectors of financial statement and stock price data for a series of years. The output includes per-share information, growth rates, and a number of financial ratios.

Documentation:
Online *DESCRIBE*

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64 *FFT*

This workspace contains functions to calculate the discrete Fourier transform of a vector of real points, or a matrix of complex points by means of the Cooley-Tuckey fast

Fourier transform algorithm. There is provision for weighting the input sequence.

Documentation:
Online *DESCRIBE*

References:
Oppenheim and Schaffer, *Digital Signal Processing* (Prentice-Hall, 1975)
IEEE Transactions on Audio and Electroacoustics, June 1967 and June 1969 (both were special issues on the FFT algorithm)
Accumulation of Round-off Errors in FFTs, *Journal of the ACM*, October 1970

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81 *CSUSAGE*

This workspace is a gateway to the CANSIM data base. For more information, see the *Public Data Bases Catalogue.*

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81 *CURRENCY*

This workspace is a gateway to the CURRENCY data base. For more information, see the *Public Data Bases Catalogue.*

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81 *IFSUSAGE*

This workspace is a gateway to the IFS data base. For more information, see the *Public Data Bases Catalogue.*

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85 *APLSORT*

This workspace contains a simple-to-use interactive sorting package. *APLSORT* does not compete with batch sorts (specifically the *SORTREQ* facility) in terms of performance; it is very useful, however, when you want to sort a small amount of data with nearly immediate turnaround.

The input file can be sorted on any combination of columns in either ascending or descending order. You can specify the collating sequence (for example, the alphabet). The sort is stable, so that records with equal keys remain in the original (input) order.

Some restrictions are imposed; for instance, the input file must be homogeneous; that is, either entirely numeric or entirely character data.

See 1 *FILESORT* for a description of a batch sorting facility.

Documentation:
Online *DESCRIBE*

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85 *MABRAUTIL*

This workspace contains APL defined functions you can use to manipulate raw data within a MABRA system in a nonprompting mode. These functions are useful for writing special routines for input, update, or reporting. Communication with the system is by way of arguments and results of functions, and thus can be embedded into a wide range of contexts. Where 86 *MABRA* is designed to be used by end users with no knowledge of APL, 85 *MABRAUTIL* is designed to be used by APL programmers.

Documentation:
Online *DESCRIBE*
MABRA (manual)
MABRA (brochure)
Changes to MABRA [since March 1980]

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86 *MABRA*

This workspace contains MABRA, a generalized record administration system that handles records with mixed-type, fixed-length fields. Typical MABRA applications are personnel, stock control, product line and orders, mailing lists, dealer and supplier lists, real-estate agent listings, and conference administration.

You don't need to know APL to use MABRA, as it guides you through itself. In 86 *MABRA*, work is carried out entirely in prompting mode, and online assistance is available

throughout the package simply by typing *HELP*. A complete set of commands is available to add, change, delete, and list up to 150,000 records, each with up to two hundred fields. Updates can be immediate or deferred (batch).

Fields may be of various types: character, integer, real, Boolean, or date, and dates may be converted to ages for reports and cross-tabulation. Auxiliary tables for storing full descriptions of fields that contain data that is coded or abbreviated can be used for reports. You can create "pseudofields" that contain data calculated on other fields. And you can "link" fields from other MABRA data bases.

Records, and fields within those records, may be selected for sorting and printing at either a terminal or a high-speed printer. Any field can be used as a search key. MABRA's built-in report writer gives you control over subtotals, page breaks, titles, etc.

MABRA also includes an *n*-dimensional cross-tabulation package with optional field totalling and averaging.

The capability for many users to share MABRA data has been designed both for orderly access and update, and for data security: access levels are broken down to record, field, and command.

Documentation:
Online *HELP*
MABRA (manual)
MABRA (brochure)
Changes to MABRA [since March 1980]

87 *CONSOL*

This workspace contains CONSOL. You can use CONSOL to maintain and produce business reports according to the structure of a particular organization. The number and types of forms, the timeframe for which data is collected, the currencies in which data is recorded, and the paths by which data is consolidated, distributed, or reported are entirely at your discretion.

CONSOL is designed to handle business reports that require data repeatedly on a monthly, quarterly, semiannual, or annual basis or for a 13-period year. Each item in a CONSOL data base is, in effect, a time series. Data from a CONSOL application can be used with other I.P. Sharp time series packages, such as MAGIC, SUPERPLOT, or EASY.

CONSOL is also a powerful means of communicating private financial data with subsidiaries or branches located anywhere on the I.P. Sharp Network.

Typical CONSOL applications include multinational financial consolidations, sales forecasting by product, acquisition analysis, inflation analysis, and currency exposure analysis.

Documentation:
Online *DESCRIBE*
Online *HELP*
CONSOL Reference Manual
CONSOL Illustrations
CONSOL (brochure)
I.P. Sharp Newsletter, March/April 1981

88 *STARS*

This workspace contains STARS: STARS facilitates the creation and storage of multiple sets of input assumptions for a model; for APL programmers implementing customized models, it's a set of utility programs intended to speed up the process of implementation. For the end user, STARS provides a uniform, easily learned method of data entry for a wide variety of applications, ranging from straightforward computational problems to complex corporate models.

Programmers that include STARS in their customized models are relieved of the task of designing the input phase, and freed to concentrate on the calculations and reports.

End users whose models are implemented using STARS need have no knowledge of APL in order to manage easily multiple sets of input to their models. Data is easily modified, facilitating "what if" and sensitivity analysis, and then saved for future reference.

Documentation:
Online *DESCRIBE*
STARS Users' Manual
STARS Steward's Manual

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91 *BIGPRINT*

This workspace contains three functions you can use to produce large characters for decoration or emphasis on reports. *BIGCHARS* outputs big block letters, each composed of normal-sized copies of the large letter. *DOT* produces results in dot-matrix form using the IBM Selectric 114 type element, and can be used with the *FINEPLOT* feature of workspace 3 *PLOT*. *LP* composes output characters out of horizontal, vertical, and diagonal lines.

Documentation:
Online *DESCRIBE*

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91 *BIOGRAPH*

This workspace contains functions you can use to produce "biorhythm" charts.

Documentation:
Online *DESCRIBE*

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91 *ELIZA*

This workspace contains an APL version of ELIZA, a program designed to hold English-language conversations. ELIZA comprises an algorithm for the analysis and construction of English phrases, and one or more scripts defining keywords and input and response patterns. It is surprising how "intelligent" the responses can appear considering that the program is quite small, as are the scripts (only about ten pages in total). This implementation uses either the "doctor" script from the original ELIZA or another less analytic "freak" script, at your option.

Documentation:
Online *DESCRIBE*

Reference:
Joseph Weizenbaum, "Eliza",
Communications of the ACM, Vol. 9,
No. 1, January 1966

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91 *FUNSPACE*

This workspace contains several "fun" functions. Included are functions to convert numbers from arabic to roman numerals and *vice versa*, to produce various types of amusing printing, and to generate magic squares.

Documentation:
Online *DESCRIBE*

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91 *PICTURES*

This workspace contains functions you can use to print pictures (from a catalogue of more than twenty), calendars, and large block-letter messages. These may be printed separately, or combined to produce captioned pictures or calendars. Output may be produced directly on the terminal or routed to a high-speed printer.

Documentation:
Online *DESCRIBE*

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92 *GAMES*

This workspace contains 15 games. Some games pit you against the computer; in others the computer just runs the game and keeps score.

The games available include: tictactoe, blackjack, showdown poker, slot machine, craps, horserace, supernim, gunfire games, hangman, scramble, finite-state machine, nim, mastermind, wumpus, and quadgit.

Documentation:
Online *DESCRIBE*

92 *SPACEWAR*
92 *STARTREK*

These workspaces contain reasonably sophisticated games of interstellar warfare, loosely based on the *Star Trek* television program. Either game requires you to use your skill and intelligence to defeat the hordes of enemy Romulans, Tholians, and Klingons that roam the Galaxy in an attempt to stop the spread of APL.

Documentation:
Online *DESCRIBE*

93 *LIFE*

This workspace contains LIFE, a solitaire game involving a world in which cells live and die according to a few simple rules. The rules have been chosen to make the behaviour of the cell population quite interesting. The game was invented by John H. Conway and described by Martin Gardner in *Scientific American*, October 1970 and subsequent issues. It is an example of a so-called cellular automaton.

Documentation:
Online *DESCRIBE*

95 *RECIPES*

This workspace is designed to let you examine a file of recipes submitted by other gastronomically inclined users of the I.P. Sharp SHARP APL service. The workspace contains programs which you can use to enter new recipes, list recipes, edit recipes you have entered previously, and even write reviews of the recipes you have tried. The programs are conversational. Whenever you do not understand a prompt, simply respond with a question mark and you will be provided with more information.

There are several ways you can search for recipes: by name, by category (for example, vegetarian), and by ingredients. You can combine these to search for, say, "Italian, without tomatoes". Once you find a recipe, you can have it multiplied by whatever amount is necessary to suit your needs.

Recipes have already been submitted for dishes ranging from flan to lobster, but we need a lot more in order to make the data base truly useful. Real enthusiasts may want to join the MAILBOX group *COOKS* where subjects of interest to users of 95 *RECIPES* are discussed.

Documentation:
Online *DESCRIBE*

121 *ARGUS*

This workspace is a gateway to the ARGREP data base. For more information, see the *Public Data Bases Catalogue.*

121 *IMPORTS*

This workspace is a gateway to the IMPORTS data base, For more information, see the *Public Data Bases Catalogue.*

121 *PETROSERIES*

This workspace is a gateway to these data bases: ARGUS, HFO, IMPORTS, IPA, LPGAS, MER, MPS, MPSR, QOS, SD, SEDS, UKET, and WSB. For more information, see the *Public Data Bases Catalogue.*

123 *ACT*

This workspace contains ACTPAK, the SHARP APL Actuarial Package; and is a gateway to the ACT data base.

ACTPAK is a comprehensive set of utility programs that embodies a standardized linear representation of the international actuarial notation. This representation scheme, coupled with the ease with which underlying calculation assumptions may be modified, enables the actuary to evaluate any closed-form actuarial expression. In addition to the

straightforward applications with ultimate mortality and a fixed interest rate, ACTPAK provides for varying time-dependent interest rates, select mortality, joint life calculations, interpolations, and either discrete or continuous operating modes.

The ACT data base, which may be used with ACTPAK or user-written programs, contains readily accessible primitive mortality information on insured lives, annuitants, and the general population, taken from over a hundred published tables. Also included in this data base are projection and salary scales as well as rates of withdrawal, disability, and remarriage.

Documentation:
ACTPAK: The SHARP APL Actuarial Package

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123 *GRADUATION*

This workspace contains functions you can use to graduate data.

Graduation is the process of securing from an irregular series of observed values of a continuous variable, a smooth regular series of values, consistent in a general way with the originally observed series. This workspace is designed to lighten the computational burden which has been historically associated with this process.

While traditionally falling within the domain of the actuary, the principles used in graduation theory extend immediately to meet the requirements of the statistician, economist, engineer, or anyone who deals with curve-fitting and interpolation.

Documentation:
Online *DESCRIBE*
Graduation

References:
M.D. Miller, *Elements of Graduation*, Actuarial Monograph 1 (The Actuarial Society of America, 1946)
T.N.E. Greville, *Part 5 Study Notes, Graduation*, (Education and Examination Committee, Society of Actuaries, 1974)

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128 *LESSOR*

This workspace contains LESSOR, I.P. Sharp's lease evaluation system. You can use LESSOR to price simple or complex leases. No knowledge of APL is required. Given any one of a required yield, an apparent rate on the transaction (ART), or a rental schedule, the system can calculate the other two. Leases can include such complicating features as investment tax credits, multiple disbursements, irregular rental schedules, and prepaids and deposits. The system can also handle floating yield rates and floating money costs. Capital cost allowance can be claimed in one of four different ways: self-shelter, maximum, tax-loss carryforward, and combination tax-loss and maximum. An input sheet is available to help prepare the lease data for entry; available reports include cash flows and amortization schedules. These can be printed either at a terminal or on a high-speed printer.

Documentation:
Online *DESCRIBE*
Lease Evaluation System

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666 *BOX*

This workspace contains the SHARP APL Message Processing Facility, MAILBOX: an efficient, simple, and secure system for instantly sending and receiving electronic mail. For international enterprises, MAILBOX provides a fast, cost-effective, and reliable means of communicating with subsidiaries or branches in the more than 350 locations served by the I.P. Sharp Network, in Europe, North America, Australia, and the Far East. Since MAILBOX sends messages to

people, not places, it allows you to communicate easily with colleagues who do a great deal of travelling.

As a member of the MAILBOX system, you have a MAILBOX code—usually an abbreviation of your name or initials. You can send a message to an individual or a group, with copies to other individuals or groups, and forward to others messages you have received. You can use MAILBOX to display the status of incoming or outgoing messages. You can classify a message as *URGENT*, *REGISTERED*, *CONFIDENTIAL*, or *PERSONAL*. In addition, MAILBOX includes a simple text editor you can use to make any necessary changes to a message before you send it. All MAILBOX commands are English-like words, so that no computer experience is necessary before you can correspond quickly and successfully with other members of MAILBOX.

Documentation:

Online *DESCRIBE*
SHARP APL Message Processing Facility
MAILBOX (brochure)
SHARP APL Mailbox Reference Card

Appendix

PUBLIC DATA BASE GATEWAY WORKSPACES

Table 1: Public Data Bases by Gateway Workspace. This table gives the data bases accessible through each public "gateway" workspace. To make the table more compact, only the data bases' *short names* are used. For more information, see the *Public Data Bases Catalogue.*

Workspace identifier	Data base
11 *BIBLIOGRAPH*	APLBIB
39 *MAGIC*	ABSDATA
	AGDATA
	ARGUS
	BIHIST
	CANSIM
	CDNBOND
	CDNOPT
	CITIBASE
	COMMOD
	CURRENCY
	FPCORP
	FPSTOCK
	FUNDMONITOR
	HFO
	IFS
	IMPORTS
	IPA
	JSCHEDULE
	LPGAS
	MBANK
	MER
	MPS
	MPSR
	MRATE
	NASTOCK
	NPADEMOG
	NPAECO
	OECD
	QBANK
	QOS
	SD
	SEDS
	TSE300
	UKCSO
	UKET
	USOPT
	USCPI
	USPPI
	WBANK
	WDEBT
	WSB
	YBANK
51 *FP*	FPSTOCK
51 *FPAM*	FPSTOCK
51 *FPNY*	FPSTOCK
51 *FPPLOT*	FPSTOCK
51 *FPREPORTS*	FPSTOCK
51 *FPSTOCKLIST*	FPSTOCK
54 *ABANKS*	YBANK
54 *MBANKS*	MBANK
54 *QBANKS*	QBANK
54 *WBANKS*	WBANK
55 *RETRIEVE*	CDNBOND
	CDNOPT
	COMMOD
	FPCORP
	FUNDMONITOR
	JSCHEDULE
	NASTOCK
	TSE300
	USOPT
81 *CSUSAGE*	CANSIM
81 *CURRENCY*	CURRENCY
81 *IFSUSAGE*	IFS
121 *ARGUS*	ARGREP
121 *IMPORTS*	IMPORTS

Workspace identifier	Data base
121 *PETROSERIES*	ARGUS
	HFO
	IMPORTS
	IPA
	LPGAS
	MER
	MPS
	MPSR
	QOS
	SD
	SEDS
	UKET
	WSB
123 *ACT*	ACT
623 *DOIDB*	DOIDB
702 *COMMUTER*	COAND
702 *ER586*	ER586
702 *ICAO*	ICAO
702 *INS*	INS
702 *MAGIC*	COPS
	FORM41
	IATA
702 *OAG2*	OAG2

Workspace identifier	Data base
702 *OAND*	OAND
702 *OD10*	OAND
702 *T6*	T6
760 *IOA*	IOA
760 *MAGIC*	AES
	ARATE
	ASE
	AUSTCOM
	COMERT1
	COMERT2
	COMERT3
	COMMBOND
	STATEX
	SYDSTOCK
950 *LIEU*	NEELS
950 *MISE*	NEELS
950 *SPILL*	NEELS
950 *UPDATE*	NEELS
1674705 *MAGIC*	AEA
3416327 *MABRA*	AISL
3416327 *MAGIC*	AISL

Table 2: Gateway Workspaces by Data Base. This table gives the "gateway" workspace you use to access each public data base. To make the table more compact, only the data bases' *short names* are used. For more information, see the *Public Data Bases Catalogue.*

Data base	Workspace identifier
ABSDATA	39 *MAGIC*
ACT	123 *ACT*
AEA	1674705 *MAGIC*
AES	760 *MAGIC*
AGDATA	39 *MAGIC*
AISL	3416327 *MABRA*
	3416327 *MAGIC*
APLBIB	11 *BIBLIOGRAPH*
ARATE	760 *MAGIC*
ARGREP	121 *ARGUS*
ARGUS	39 *MAGIC*
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